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EVALUATING THE EFFECTS ON HEMATOLOGIC PARAMETERS BY FREQUENT PLATELET PHERESIS DONATIONS

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ABSTRACT

Background: Platelet components are prepared from either whole-blood donation or apheresis collection. Subjects who donate platelets often are the focus of more concern.

Aim: The purpose of this study was to evaluate how frequent plateletpheresis affected the hematologic parameters in the donors who were doing it often.

Methods: Participants in the current study were plateletpheresis donors who had donated twice in a month. Additionally, donors having platelet pheresis for the third or fourth time had to meet the inclusion criteria. After platelet pheresis, the hematologic parameters were evaluated and compared on recalls.

Results: There was a non-significant difference in all the parameters between the two study subject groups' pre-first and pre-second durations, with the exception of haemoglobin, for which the intergroup p-values were 0.227 and 0.882 for PDW, 0.886 and 0.368 for MOV, 0.459 and 0.084 for PCT, 0.279 and 0.004 for TPC, and 0.376 and 0.438 for TLC, 0.487 and 0.333 for RDW, 0.236 and 0.434 for MCHC, 0.209 and 0.047 for MCH, 0.077 and 0.100 for MCV, 0.416 and 0.867 for HCT, 0.025 and 0.029 for RBC, and 0.285 and 0.604 for haemoglobin, respectively. The intragroup difference was not statistically significant across all measures.

Conclusion: According to the current study's findings, plateletpheresis may be performed often on these donors without negatively affecting their hematologic parameters. Same follow-up findings post-donation were found for hematologic parameters in the donors.

Keywords: Mean Corpuscular HB Concentration (MCHC), Mean Corpuscular HB (MCH), Plateletpheresis, Single Donor Platelets, White Blood Cells (WBC)

INTRODUCTION

Concentrated Platelet donation by single donor, which causes a temporary decline in the platelet counts, is called as plateletpheresis. The U.S. Food and Drug Administration (FDA) rules permit a donor to donate up to 12 times year, with a maximum of two times per week and a minimum of 48 hours between donations. Following a review, these restrictions were revised in 2005 to allow for 24 donations annually, with a maximum of 3 components contributed at a time.[1] However, concerns about persistent and long-term declines in platelet counts were raised in participants receiving plateletpheresis on a regular basis. Frequent plateletpheresis should not be restricted, according to prior research data, since this might have a detrimental impact on the components of apheresis and their accessibility in the medical sector. Additionally, statistics from published literature highlight the decline in haemoglobin, hematocrit, platelet count, and white blood cell count in blood samples taken 30 minutes after plateletpheresis.[2]

Documented literature data supports the idea that this drop in hematologic parameters does not continue for an extended period of time. But the tools and supplies utilised in the plateletpheresis process control its persistence. Nevertheless, there is little research on this plateletpheresis pattern in the earlier literature. Plateletpheresis is available on demand and is regularly performed in a variety of Indian settings.[3] In order to help the afflicted people, family and attendants endure

repeated and frequent plateletpheresis. This gives the researchers the chance to evaluate hematologic abnormalities in these subjects.[4] In order to determine how frequent plateletpheresis affected the hematologic parameters in the frequent donors, the current investigation was carried out.

MATERIALS AND METHODS

The goal of the current study was to evaluate how frequent plateletpheresis affected the hematologic parameters of the donor. The study was conducted at SRVS Medical College Shivpuri, Madhya Pradesh after obtaining clearance from the concerned Ethical committee. The individuals having routine plateletpheresis at the Institute counted as study population. Individuals who regularly underwent plateletpheresis at the institution and met the inclusion criteria were enrolled as study participants.

Following final inclusion, each participant underwent a thorough general examination and history, and they then filled out a regular questionnaire in detail. All subjects gave their written and verbal informed permission after being fully told about the study's concept. Every individual who received several plateletpheresis procedures within the designated research period was deemed eligible to participate in the investigation.

Prior to plateletpheresis, all of the individuals had screening and counselling. Following collection, the blood samples were evaluated for hematologic parameters, blood grouping, and illnesses that may be contracted by blood transfusion assessed with chemiluminescence immunoassay. The hematologic parameters that were evaluated included white blood cells (WBC), mean corpuscular HB concentration (MCHC), mean corpuscular HB (MCH), mean corpuscular volume (MPV), hematocrit, red blood cells (RBC), and haemoglobin. Platelet distribution width (PDW), mean platelet volume (MPV), platelet crit (PCT), total platelet count (TPC), and haemoglobin.

Based on the Director-General of Health Services recommendations, the standard operating protocol was applied in all the subjects for the apheresis process. ACD-A, or anticoagulant citrate dextrose solution-A, was employed in the current investigation as an anticoagulant in a 1:12 to 1:7 ratio to the whole blood. Every treatment was targeted for the collection of 3×1011 platelets in 200–250 cc of plasma. Regular protein analysis was not conducted. Subjects who received their second donation more than 30 days apart met the study's exclusion criteria. Twelve hours before to the process, pre-plateletpheresis samples were obtained for the evaluation of hematologic parameters. The blood drawn at the second visit, which was also compared with pre-plateletpheresis data, provided follow-up data.

The study subjects were split into two groups: Group I included individuals who had a second plateletpheresis within a week, while Group II included those who had a plateletpheresis between eight to thirty days. Subgroups IA and IIA were created for platelet counts of 150,000 and 200,000/µl, IB and IIB for counts between 200,000 and 300,000/µl, and IC and IIC for values over 300,000 for both groups.

Using SPSS software version 21 (Chicago, IL, USA) for statistical assessment and one-way ANOVA and t-test for result formulation, the gathered data were examined. The data were presented as a mean, standard deviation, percentage, and number. At $p<0.05$, the significance threshold was maintained. Figure 1 shows one finished case.

RESULTS

Among the plateletpheresis donors in this research were those who had donated twice in a month. Additionally, donors having platelet pheresis for the third or fourth time had to meet the inclusion criteria. After platelet pheresis, the hematologic parameters were evaluated and compared on recalls. During the specified study period, 940 plateletpheresis procedures were carried out in the institution on 121 people who were donors at least twice a year. In this study, 120 men and 1 woman participated. The research respondents ranged in age from 18 to 50 years old, with a mean age of 28.98±8.12 years. Of the 121 participants, 88 had plateletpheresis for the second time and were examined. Hematologic indicators were assessed between the first donation and the second visit. Apart from MPV (mean platelet volume), which was substantially greater after the second donation compared to the first donation with $p<0.05$, all the data were comparable and did not alter statistically at two-time intervals (Table 1).

At the second donation, MPV rose considerably to 15.8±2.07 with $p <0.05$, from a baseline of 9.82±1.98. Table 1 shows a non-significant decline in haemoglobin from baseline to the second donation, from 15.06±1.13gm% to 15.02±1.07gm%. The study's donors were split into two groups: Group I included individuals who had a second plateletpheresis within a week, while Group II included those who had a plateletpheresis between eight to thirty days. There were 30 patients in Group I and 58 in Group II. It was observed that in the two research subject groups, there was a non-significant difference for all parameters prior to the first and second durations.

Hemoglobin's pre-first and pre-second intergroup p-values were 0.227 and 0.882 for PDW, 0.886 and 0.368 for MOV, 0.459 and 0.084 for PCT, and 0.279 and 0.004 for TPC. Prior to the second donation, there was a significant difference in TCP between the two groups at 0.376 and 0.438 for TLC, 0.487 and 0.333 for RDW, 0.236 and 0.434 for MCHC, 0.209 and 0.047 for MCH, 0.077 and 0.100 for MCV, 0.416 and 0.867 for HCT, 0.025 and 0.029 for RBC, and 0.285 and 0.604 for haemoglobin, respectively. Table 2 provides an overview of all the metrics that demonstrated non-significant

intragroup differences. After undergoing plateletpheresis, the study participants' platelet counts were evaluated. Of the eight donors in group I, subgroup A, 75% of the individuals had higher platelet counts (n = 6), whereas 25% of the subjects had lower platelet counts (n = 2). The average increase from the baseline was 35650/µl, while the average reduction was 30400/µl. Out of the 18 individuals in Subgroup B, 22.22% (n=4) had higher platelet counts whereas 77.77% (n=14) had lower platelet counts. The average increase in counts from the baseline was 36000, while the average drop was 44170/µl. In subgroup C, the counts have declined in 25% (n=1) of the participants and fell in 75% (n=3) of the subjects, with a mean rise of 18320/µl from baseline. The average drop from the starting point was 56400/µl. Subgroup A included 12 of the 58 participants from Group II; of these, 83.33% (n = 10) had an increased count with a mean rise of 26260 /µl from baseline, and 16.66% (n = 2) had a drop with a mean decrease of 24820 /µl from baseline. Within subgroup B, platelet counts were higher in 59.45% (n = 22) of the individuals, with a mean rise of 43810, and lower in 40.54% (n = 15) of the subjects, with a mean drop of 30500/µl from baseline. Table 3 indicates that all participants in subgroup C had elevated platelet counts, with a mean rise of 17500/µl from baseline.

DISCUSSION

The current study evaluated plateletpheresis donors who gave blood for the second time in a given month. Additionally, donors having platelet pheresis for the third or fourth time had to meet the inclusion criteria. After platelet pheresis, the hematologic parameters were evaluated and compared on recalls. During the specified study period, 940 plateletpheresis procedures were carried out in the institution on 121 people who were donors at least twice a year. In this study, 120 men and 1 woman participated. The research respondents ranged in age from 18 to 50 years old, with a mean age of 28.98±8.12 years. Of the 121 participants, 88 had plateletpheresis for the second time and were examined.

Hematologic indicators were assessed between the first donation and the second visit. Every measure was similar, showing no statistical difference between the two time points, with the exception of MPV (mean platelet volume), which showed a substantial increase ($p<0.05$) between the first and second donations. At the second donation, MPV rose considerably to 15.8±2.07 with $p <0.05$, from a baseline of 9.82±1.98. From the initial donation to the second, haemoglobin dropped non-significantly from 15.06±1.13gm% to 15.02±1.07gm%. These outcomes were in line with those of Duggan F et al.[2] and Akkerman JW et al[4] and de Aguilar-Nascimento et al.[5] (2012), who also found that plateletpheresis did not significantly alter hematologic markers.

The study subjects were split into two groups: Group I included participants, who had a second plateletpheresis within a week, whereas, Group II had subjects who underwent plateletpheresis within 8-30 days. There were 30 patients in Group I and 58 in Group II. The results showed that there was a non-significant difference in the pre-first and pre-second durations for all the parameters in the two study subject groups, with the exception of haemoglobin, for which the intergroup p-values were 0.227 and 0.882 for PDW, 0.886 and 0.368 for MOV, 0.459 and 0.084 for PCT, 0.279 and 0.004 for TPC, and 0.376 and 0.438 for TLC, 0.487 and 0.333 for RDW, 0.236 and 0.434 for MCHC, 0.209 and 0.047 for MCH, 0.077 and 0.100 for MCV, 0.416 and 0.867 for HCT, 0.025 and 0.029 for RBC, and 0.285 and 0.604 for haemoglobin, respectively. There was no significant intragroup difference observed in any of the parameters. These findings corroborated those of Sachdev R et al.[6] (2014) and Budak YU et al.[7] (2016) studies, which presented findings similar to the current investigation that showed no discernible changes in hematologic markers after plateletpheresis donation.

Regarding the variations in platelet counts among the research participants after plateletpheresis, group I's subgroup A comprised 8 donors, of whom 75% (n = 6) had higher platelet counts and 25% (n = 2) had lower counts. The average increase from the baseline was 35650/µl, while the average reduction was 30400/µl. Out of the 18 individuals in Subgroup B, 22.22% (n=4) had higher platelet counts whereas 77.77% (n=14) had lower platelet counts. The average increase in counts from the baseline was 36000, while the average drop was 44170/µl. In subgroup C, the counts have dropped in 25% (n=1) of the participants, with a mean fall from baseline of 56400/µl, and decreased in 75% (n=3) of the subjects, with a mean rise of 18320/µl. Subgroup A included 12 of the 58 participants from Group II; of these, 83.33% (n = 10) had an increased count with a mean rise of 26260 /µl from baseline, and 16.66% (n = 2) had a drop with a mean decrease of 24820 /µl from baseline. In subgroup B, the mean rise in platelet counts was 43810 for 59.45% (n = 22) of the individuals, whereas the mean drop in platelet counts was 30500/µl for 40.54% (n = 15) of the subjects from baseline. In subgroup C, all subjects showed increased platelet counts with a mean increase of 17500 /µl from baseline. These outcomes were in accordance with those of studies conducted in 2014 by Lippi G et al.[8] and in 2016 by Thokala RP et al.[9] who reported comparable increases and decreases in platelet counts after plateletpheresis from baseline values.

CONCLUSION

Within the constraints of the study, the current findings indicate that recurrent plateletpheresis administration does not adversely affect the hematologic parameters of the donors. The donors' hematologic parameters showed the same follow-up outcomes after the donation. A few drawbacks of the current study were the limited sample size, brief monitoring

time, IOPAR usage, and biases related to geographic areas. Therefore, further long-term research with bigger sample sizes and longer observation periods will aid in coming to a conclusive result.

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TABLES

Parameter	Baseline	2nd donation	p-value
PDW	15.54±2.03	15.83±2.06	>0.05
MPV	9.82±1.98	15.8±2.07	<0.05
PCT	0.24±0.07	0.23±0.07	>0.05
TPC	242.58±56.68	242.76±57.69	>0.05
TLC	7.46±1.56	7.46±1.53	>0.05
RDW	14.13±1.38	13.98±1.39	>0.05
MCHC	33.97±1.48	33.77±1.57	>0.05
MCH	30.02±3.06	29.78±2.98	>0.05
MCV	88.77±6.58	88.63±6.38	>0.05
HCT	44.53±3.25	44.19±5.13	>0.05
RBC	5.05±0.45	5.04±0.45	>0.05
Hb	15.06±1.13	15.02±1.07	>0.05

Table 1: Changes in hematologic parameters at baseline and 2nd donation in the study subjects

Parameter	Subgroup	Pre 1st donation	Pre 2nd donation	p-value
PDW	Group I	15.16±2.39	15.82±1.82	0.204
	Group II	15.66±1.75	15.84±2.07	0.619
	p-value	0.227	0.882	
MPV	Group I	10.08±1.47	9.48±2.07	0.077
	Group II	9.66±9.62	9.05±1.94	0.158
	p-value	0.886	0.368	
PCT	Group I	0.24±0.07	0.22±0.06	0.036
	Group II	0.25±0.07	0.24±0.08	0.812
	p-value	0.459	0.084	
TPC	Group I	234.4±53.68	220.68±54.37	0.096
	Group II	247.26±58.18	255.04±56.22	0.203
	p-value	0.279	0.004	
TLC	Group I	7.65±1.59	7.66±1.44	0.946
	Group II	7.36±1.55	7.36±1.63	0.955

	p-value	0.376	0.438	
RDW	Group I	14.22±1.54	14.17±1.36	0.348
	Group II	14.02±1.27	13.88±1.32	0.228
	p-value	0.487	0.333	
MCHC	Group I	33.83±1.54	33.97±1.94	0.606
	Group II	34.17±1.46	33.66±1.36	0.082
	p-value	0.236	0.434	
MCH	Group I	30.57±2.48	30.57±2.27	0.812
	Group II	29.75±3.27	29.37±3.17	0.006
	p-value	0.209	0.047	
MCV	Group I	90.36±5.97	90.18±5.72	0.729
	Group II	87.85±6.76	87.97±6.62	0.739
	p-value	0.077	0.100	
HCT	Group I	44.16±2.56	44.07±3.06	0.893
	Group II	44.71±3.51	44.26±5.95	0.454
	p-value	0.416	0.867	
RBC	Group I	4.93±0.38	4.87±0.37	0.914
	Group II	5.13±0.48	5.07±0.42	0.717
	p-value	0.025	0.029	
Hb	Group I	14.94±1.16	14.95±1.02	0.962
	Group II	15.16±1.07	15.07±1.07	0.277
	p-value	0.285	0.604	

Table 2: Change in hematologic parameters pre 1st donation and pre 2nd donation in the two groups of the study subjects

Gr	Subgroup	Total donors	Donor number with counts increased from baseline (%) n (%)	Mean rise from baseline (/µl)	Donor number with counts decreased from baseline (%) n(%)	Mean drop from baseline (/µl)
I	Subgroup A	8	6 (75)	35650	2 (25)	30400
	Subgroup B	18	4 (22.22)	36000	14 (77.77)	44170
	Subgroup C	4	3 (75)	18320	1 (25)	56400
II	Subgroup A	12	10 (83.33)	26260	2 (16.66)	24820
	Subgroup B	37	22 (59.45)	43810	15 (40.54)	305000
	Subgroup C	4	4 (100)	17500	0	0

Table 3: Effect of plateletpheresis on platelet counts in the study subjects